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ABSTRACT

In almost all its aspects, radiologic technology education is adult education. Boyle's (1981) adult learning model has four components: (1) the learner in terms of motivation; (2) learning as a change process; (3) the experiential role of education; and (4) the facilitative role of the educator. Andragogy, as defined by Knowles (1977, 1980), is a set of assumptions about adult learning (e.g., adults desire and implement a tendency toward self-directedness as they mature). When the critical thinking literature is compared with andragogy, it is found that many assumptions and lack of assumptions are similar. The two aspects of adult education most relevant to radiologic technology educators are teaching entry-level adult students, and continued professional education. Littlefield (1991) suggested that adult education, as related to radiologic technology, must define the broad mission of adult education, review philosophical assumptions, and combat some common misconceptions. The literature indicates that radiologic technologists need to participate in continuing education from a standpoint of accountability rather than mandate. Research on radiologic technologists' participation in continued education has focused on motivation, educational needs, and barriers. Research suggests that adult learning should be fused with concepts of leadership to develop a teaching model. The philosophy, history, and practices of adult education should be integrated with the discipline of radiologic technology as a guide to future theory and practice. (57 references) (YLB)

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Adult Education in Radiologic Technology:
A Review

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The experience of life itself is the real test of capacity for any kind of profession...

Wilhelm Conrad Roentgen
Discoverer of the Roentgen
or x-ray. (1845-1923)

Introduction

This paper will review adult education in general as well as its applications to the field of radiologic technology. In almost all of its aspects, radiologic technology education is adult education, though the profession has sometimes been criticized for taking an overly "pedagogical" approach to education. This critique is not unique to this profession; in many fields, for example, Knox (1986) notes that the majority of instructors are "expert in the content they teach, but they usually have little preparation in the process of helping adults learn." An adult learning model will be presented, and the concept of andragogy will be defined. The two aspects of adult education most relevant to educators in the field of radiologic technology will be presented - teaching entry-level adult students and continued professional education.

Adult education is a means of meeting societal goals, or as stated by Darkenwald and Merriam (1982), a "social enterprise." Health care organizations need individuals able to deliver competent and compassionate care to patients. This paper will seek an integration of the conceptual foundations of adult education with the concerns of individuals and institutions, specifically radiologic technologists, radiologic technology educators, colleges, hospitals, and society. In 1980 Knowles

stated that there was no "coherent unity" to adult education, it is instead a "complex mosaic of unrelated activities and processes that permeate almost all the established organizations in our society." This paper will be broad and integrational in approach, to give a philosophy of adult education upon which practice in radiologic technology can be based (see, for example, Elias and Merriam, 1980, pp. 4-8 and pp. 205-206).

Principles of Adult Learning

Darkenwald and Merriam (1982) have listed the following as principles/guidelines of adult learning based on learning-process research:

- Adults' readiness to learn is dependent upon previous learning.
- More permanent and pervasive learning comes from intrinsic motivation.
- Positive reinforcement is effective.
- Material should be presented in an organized fashion.
- Repetition enhances learning.
- More meaningful tasks and materials are more fully and easily learned.
- Active participation in learning improves retention.
- Environmental factors affect learning.
- Adults learn throughout their lifetime.

Adults exhibit learning styles including the following:

1. They have personal strategies for coding and encoding information.
2. Cognitive procedures or ways of learning differ.

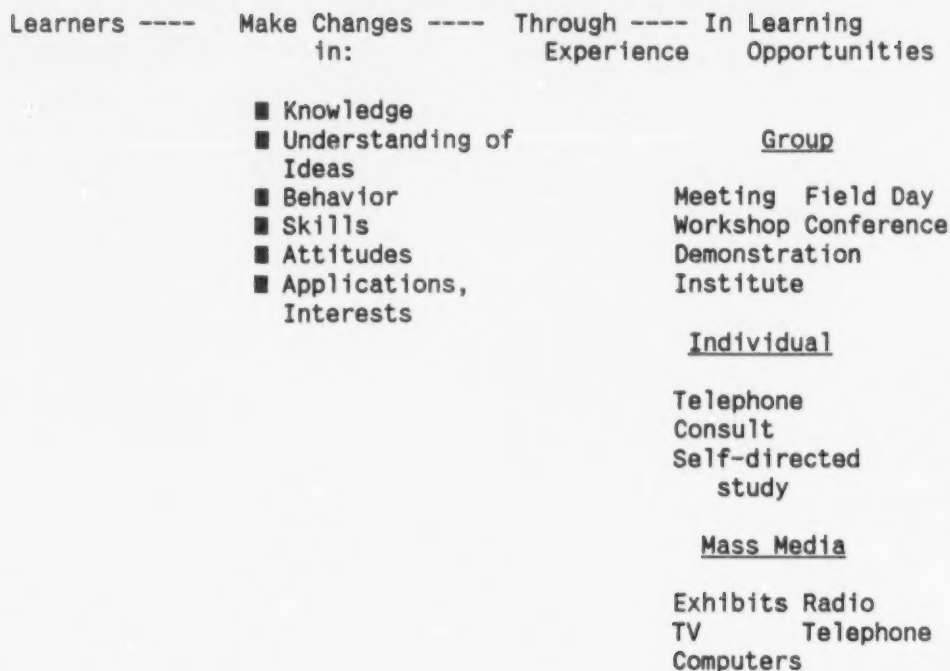
3. They like learning activities to be problem-centered and relevant to real-life.
4. They want some immediate appreciation.
5. They have their own concept of themselves as learners.
6. They are self-directed.

An Adult Learning Model

Adult learners make changes through experiences of various kinds. Boyle (1981) has developed a model for learning opportunities. A modified version of this model can be seen in Figure 1.

The next four sections will focus on the components of this model: 1). The learner in terms of motivation; 2). Learning as a change process; 3). The experiential role of education; and 4). The facilitative role of the educator.

Figure 1
Adult Learning Model



| | | | | | | | | | | | | | | |
Facilitative role of educator

Motivation and the Learner

Adults will be (and it could easily be argued that all individuals will be) motivated to learn those things that have personal meaning. Also, being in a state of transition from one stage of life to another will motivate (as well as cause) the adult to learn.

For the radiologic technologist, there is a need to consider both the personal and professional development of the individual. The psychosocial development of the radiography student has been presented in an Eriksonian framework (Dowd, 1984). Erikson (1974) described personality as being determined by both an inner motivational "ground plan" and by the external demands of society. Ego development involves a sequence of eight psychosocial stages, biologically based, and constituting a fixed, universal sequence.

Within each stage a particular capability of the ego must be developed if individuals are to adapt to the demands placed on them by society at that time. If the capability is not developed within the allotted time, that aspect of the ego will be impaired. Each stage, then, has its own crisis to resolve - either the individual will attain and sense the development of the appropriate capability, or will not obtain and will not sense the development of the appropriate capability.

In adulthood, the first crisis is developing a sense of generativity versus a sense of stagnation. Generativity requires that the individual contribute to the maintenance and preparation of society. If this does not occur, a sense of stagnation results. The mature adult must come to a sense of integrity or face despair.

Edwards (1983) developed a stage or matching model for continuing education based on research and practice. Her model is similar to that of Hunt and Sullivan (1974), who proposed three levels of learners. Their Level I learners are oriented

toward the practical, do not look to new ventures, and need learning sanctioned by an authority. Level II learners are in transition, realizing that there is more than one way to do things. The learners at Level III want instruction to be more individualized, and prefer to plan their own learning activities.

Edwards studied inservice and continuing education practices of radiologic technologists in the United States, finding mostly lectures "with minimal accommodations to individual differences." She also theorized three levels of learners. First is the *new technologist*. This individual is moving from the relative security of the training program to "complex demands of the profession, and needs to be supported in that role." The second level is a *practicing technologist* with three to eight years of experience. Preparation for a supervisory or other advanced role is usually a concern as well as content expertise.

The third level is the *experienced technologist*. This individual is interested in activities that are not the "normal" kind of inservice activities such as lectures. They want to be able to reflect on their practice, as well as share their expertise, if possible.

Wlodkowski (1985) has suggested six major factors that have an impact on learner motivation:

- Attitudes
- Needs
- Stimulation
- Affect (intrinsic motivation)

- Competence
- Reinforcement.

Change and Learning

Value systems, beliefs, and behaviors are intrinsic to the individual, though they were originally assimilated from another source (Brookfield, 1986). Adult learning is crippled when the individual cannot critically reflect on assumptions, imagine alternatives, and function in a self-directed, autonomous manner (Schon, 1983). For learning to be a change strategy for adults, according to Verduin, Miller, and Greer (1977), behavior change will come about only if the way individuals perceive their environment changes.

A literary analogy can be seen in the work of John LeCarré (1968), who in, A Small Town in Germany, states that "how else . . . do fancies multiply, how else is wisdom forged, and a course of action finally resolved upon, if not through doubt?" Doubt, not faith, LeCarré notes later, is the greatest gift, as it makes us aware of the possible consequences of our acts, and how mixed they can be (Wallace, 1985).

One of the philosophical views of adult education is that it does not exist to preserve the status quo (eg., Ilich, 1970; Friere, 1970) but to bring about personal and societal improvement. Knowles has stated that such an environment has changed the purpose of teaching from what we know to what we don't know. Such an attitude is probably difficult for many to accept, as in such an environment it becomes more important to know which questions to ask than to have pat answers based on

"expert" opinions.

The aims and objectives of adult education are 1). cultivation of the intellect; 2). individual self-actualization; 3). personal and social improvement; and 4). social transformation (Darkenwald and Merriam, 1982). Lindemann (1926) stated that adult education was for those individuals who would be free:

who know their powers and capacities as well as their limitations; who seek a way of life which utilizes their total personalities; who are able to alter their conduct in relation to a changing environment in which they are conscious of being change agents.

Most allied health professions still teach to a "one right way" method (Dowd, 1991), which may be necessary to a certain extent (task performance being prime), but cripples the ability of individuals to be that change agent. Savitt and Kopperl (1982) noted that enforced subservience crippled the professional standing of nurses, citing this 1917 statement from the American Journal of Nursing:

The first and most helpful criticism I ever received from a doctor was when he told me I was supposed to be simply an intelligent machine for the purpose of carrying out his orders.

Adult education has the potential to produce those change agents that can eliminate the specter of subservience from allied health; but not by applying isolated principles of adult education to an already dysfunctional model of education that

binds rather than frees the individual.

Experience and Learning

The two major theories of learning (behaviorist and phenomenological or humanistic) offer opposite, though probably not mutually exclusive, views of the role of experience in learning. Elias and Merriam (1984) devote one chapter of their text to "Behaviorist adult education," (Watson and Skinner being the historically important theoreticians) and another to "Humanistic adult education" (Maslow and Rogers). Behaviorists focus on actions, humanists on awareness.

It is well known in education that "the ability to perform a task does not signify an understanding of that task" (Dowd, 1987). However mere understanding also does not signify ability to perform. Instead holistic attention to the needs of the learner is necessary. Some types of learning and some types of learners require a stimulus - reinforcement environment, whereas in others an awareness is necessary, and in still other some type of mix is required.

Teacher as Facilitator

In adult education, the teacher is less often seen as "expert" and more often as a facilitator. This individual assists the learner in considering alternatives, reflection, and becoming proactive. Ruddock (1980) identifies the following roles:

1. Resource person
2. Expositor
3. Demonstrator

4. Value promulgator
5. Task master
6. Assessor
7. Helper and group manager.

The historical foundation for this role can be seen in Lindemann (1926), who, influenced by Dewey, said that educators of adults were no longer "oracles" who spoke from authority, but "guides or pointer-outs." What is questionable is to what extent educators have internalized such a value. Galbraith and Shedd (1990) feel that there are a variety of barriers that prevent faculty from being effective at facilitating adult learning, especially those who seem to be "peripheral" to the broad mission of the college - such as clinical faculty.

Pedagogy Vs. Andragogy?

Andragogy, as defined by Knowles (1977; 1980) is a set of assumptions about adult learning:

1. Adults desire and implement a tendency toward self-directedness as they mature.
2. Adults' experiences constitute a rich learning resource. They learn more effectively through experiential activities such as problem-solving.
3. Adults have an awareness of specific learning needs generated by real life.
4. Adults are competency-based learners with the desire to apply knowledge to immediate circumstances.

There is a need, according to Knowles, to emphasize a climate of mutual respect and trust, support, and caring -

something which has, interestingly, also been cited in the critical thinking literature (Dowd, 1991; Miller and Malcolm, 1990). It is interesting to compare the pedagogical critical thinking literature with andragogy; many of the assumptions and lack of assumptions are similar. For example, Galbraith (1990) notes the need for challenge and risk-taking that promotes the development of the learner and facilitator.

About five years ago andragogy was much discussed in the radiologic technology literature, though its conceptual nature was often misunderstood. As opposed to traditional concepts of pedagogy, which is the art and science of teaching children, andragogy does not make the following assumptions:

1. The learner is essentially a dependent person.
2. The learner's experience is too limited to be built on.
3. The learner is not ready to learn until prompted.
4. The learner is subject rather than problem-centered.
5. The learner's motivation is triggered by external rewards and punishments (Knowles, 1975).

Andragogy has been most often misunderstood in terms of its lack of assumptions instead of the assumptions made. Ubaldi (1985) stated that "andragogy is largely a group discussion approach to learning," and focuses on Moulton and Blake's (1984) method termed "synergogy." According to Ubaldi, synergogy avoids the weaknesses of both pedagogy and andragogy, while preserving the strengths of the two approaches:

1. The expert has a role in providing subject matter

about topics of study; and

2. The learner remains active and is responsible for personal learning.

Though the methods (or tactics) presented by Ubaldi are of value, his belief that andragogy, pedagogy, and possibly even synergogy are methods rather than concepts cripples his discussion. Knowles (1975) noted that "pedagogy and andragogy should not be viewed as separate dichotomies, but as ends of the same spectrum with a realistic solution falling somewhere in between." Examples of this approach include the "Integrated model of learning" (Trigg and Cordova, 1987), or self-directed learning packets, which are in opposition to truly self-directed learning, "other-defined activities" (Clark and Dickinson, 1984). That is, a content developer controls such learning variables as objectives, content, and evaluative criteria for the topic of study. The learner controls aspects of study such as the need to learn, time commitment, environment, depth of study, as well as further learning experiences.

Integrating Adult Learning into Radiologic Technology

Many articles focusing on adult education can be found in the radiologic technology literature. In addition to the articles by Ubaldi (1985), Trigg and Cordova (1987), and Edwards (1983), a variety of articles have reviewed adult education conceptually (eg., Seubert, 1982; Galbraith and Simon-Galbraith, 1984), as well as in terms of its most commonly discussed application, continued professional education. Continued professional education in its essence and applied to radiologic

technology will be discussed later.

Recently Littlefield (1991) has suggested that adult education as related to (or perhaps better stated-integrated into) radiologic technology must first define the broad mission of adult education, and review philosophical assumptions, as well as combat some common misconceptions. The broad mission of adult education is:

- Education for occupational, vocational, and professional competence or economic efficiency.
- Education for personal or family competence or human relationships.
- Education for social and civic competence or civil responsibility.
- Education for self-actualization or personal satisfaction.

The various philosophical assumptions that must be considered are:

- Education must be planned, organized, and offered on a life-long basis.
- A national adult and continuing education program should be concerned with educational needs and benefits.
- Adult education should be relevant to the needs and interests of all segments of society and within their economic means.
- Institutions and programs of adult education should be readily accessible.

- Continuing education must be encouraged with broad social support and with rewards, incentives, and recognition for participants.

The following misconceptions must be considered:

- Young people need education while adults do not. The education one receives as a child (or as a student) will keep through life.
- Education is the same as schooling.
- Teachers, instructors, and educators work only in a formal organizational setting.
- There is little difference between teaching adults and children.

Adult/Continued Education in Radiologic Technology

The focus of adult education as applied to radiologic technology has been in terms of continued education. Boissoneau (1977) felt that radiologic technologists needed to participate in continuing education from a standpoint of accountability rather than mandate. Fay (1979) echoed that sentiment, and also noted that need for continued education in the field to reflect a "career ladder" concept, something that remains unresolved today.

The concept of mandated continued education, according to Darkenwald and Merriam (1982), fits well the medical model of treatment (symptoms -- diagnosis -- prescription -- cure) applied to knowledge and learning. It is probably not surprising then, that the profession of radiologic technology, strongly steeped in the medical model, has so strongly favored mandated continued education. In addition to the states requiring continued

education for relicensure, the national certification organization (The American Registry of Radiologic Technologists) has indicated that mandatory continued education will be necessary for recertification by 1997. Darkenwald and Merriam note a variety of problems with such mandates:

1. It is dubious that outside authorities know best what is good for an individual.
2. What may appear to be inadequate knowledge is actually another lack - equipment, supervision, or conflicting expectations.
3. Education is not a panacea for all ills.
4. No one can be forced to learn.
5. Mandatory continued education is inferior to enforced competency examination.

They also note that "It is particularly disturbing that these obvious truths have been ignored by proponents of mandatory continuing education for licensed professionals," also stating that "mandatory continuing education is neither necessary or sufficient" to protect the public from incompetence. Lindemann noted many years ago (1926) that "propaganda organizations will of course use adult education to their own ends - which, unhappily, will lead to further illusions regarding education."

Dowd (1990) noted that the "changing face" of adult education, as described by Finger (1989), was going to pose challenges to radiologic technology. In terms of Houle's (cited in Cook and Lawler, 1991) pyramid of leadership, most radiologic technology educators occupy a position in the middle. This

middle area of the pyramid consists of educators who as a part of their paid employment combine with adult education functions with other duties.

Radiologic technology education is changing in that adult education of practitioners has assumed added importance while the average student age at entry-level is also increasing. Most educators in the field are generalists, and thus might spend one hour discussing medical ethics with a group of entry-level students, and spend the rest of the afternoon preparing a lecture to be given that night to practitioners on radiology information systems.

Finger believed that such role-splitting was very common, but would also have to change. He noted the split between vocational and personal development, and felt that educators would have to specialize. However, it might be argued that a balance is precisely what is needed. For example, in AIDS education (Dowd, 1990) it has been shown that attention to the "facts" only is insufficient - there must be a blending of knowledge with values. Many individuals (entry-level students and practitioners) have phobias, prejudices, and beliefs that must be dealt with. Often the poor attitudes shown by individuals are a reflection of "knowledge" that is little more than media misinformation, phobic "jokes", and personal prejudice. Another use of this method of instruction (termed by McKenna et al. (1989) Value Analysis, a fusion of value clarification with factual information) for the profession is in radiation protection (Dowd, 1991), where apathy towards protection of the

patient is unfortunately sometimes the rule rather than the exception (Franz, 1983).

To bring about that knowledge-based learner who can also reflect, imagine alternatives, and function in a self-directed, autonomous manner (Schon, 1983) requires attention to 1). individual beliefs; 2). presenting knowledge; and 3). re-evaluating beliefs. It must be asked whether this can be achieved by a specialist, or a generalist. Guttierrez (1991) has noted that the traditional student no longer prevails; "The student of the 90's is everyone." From a pragmatic, limited-resource viewpoint, a continued emphasis on generalities will be desirable.

Research of Radiologic Technologist's Participation In Continued Education

Darkenwald and Merriam (1982) state that participation research in adult education is especially important as there is no good firm definition of adult education, with the effectiveness and survival of programs dependent on an understanding of the "needs, problems, attitudes, and preferences of clientele and potential clientele." In many ways, it is the "market research" of adult education. In the first published analysis of participation in radiologic technology, Kyles and Kopec (1975), prior to mandated continuing education in New Jersey for technologists, found that over ninety-four percent of respondents were "interested," but less than sixteen percent were actually participating. They also felt that "if continued education programs are properly designed, they will not have to

be made mandatory. Instead, people will automatically attend them."

Craychee (1981) developed mathematical constructs based on expectancy-value model of social psychological theory, and proposed a model to predict intentions to participate in continuing education. Based on a survey of technologists, those with an intent to participate had a more positive attitude, a stronger inclination to believe that specific goals are achievable by participating, as well as a more positive perception of significant others' thinking regarding their participation.

Harriman (1984) studied the perceptions of radiologic technologists toward mandatory continuing education. He found six variables that were significantly correlated with an acceptance of mandatory continued education. These were maximum distance willing to travel, participant's willingness to pay, highest level of education completed (which in interesting contrast to what is usually believed was an inverse relationship; that is, as level of education increased, the acceptance of mandatory continued education decreased) quality of program available outside place of employment, number of states practiced in, and number of hours attended in the last six months.

Adams (1988) studied the relationship between participation in continued education and entry-level education (hospital vs. community college based program), job satisfaction, perceived job performance, and demographic characteristics. His only significant finding was that college graduates were more

likely to have completed college credit over hospital graduates.

Slechta et al. (1989) determined the continuing education needs of California technologists. They received a 26.6 percent response rate to their survey of 3,000 California technologists (799 respondents), and a 28.8 percent response rate to their survey of California radiologists (346 respondents from a survey group of 1,200). Data relevant to this study showed that technologists prefer clinical hands-on training experiences to all other forms of continuing education, including self-directed study. Also, chi-square showed that technologists receiving financial support are more likely to engage in continuing education than those who did not ($p < 0.001$). Other motivators to participation could not be identified. Those that did not participate in continuing education indicated in twenty-seven percent of the cases that their employer did pay; of those that did participate, fifty-six percent indicated that their employer paid for their continuing education.

Thomas Edwards (1990) performed a casual-comparative study of the influence of motivational orientation and professional, educational, and personal characteristics of certified radiographers on actual and preferred participation in continued professional education. He also studied to what extent knowledge and skills acquired through participation matched use on-the-job. Surveying radiographers employed in hospitals in central Florida, he recieved a 73.6 percent response rate ($n = 295$). Participation varied demographically (by area); however, college courses were consistently preferred by respondents.

Motivation was found to influence type of provider used and preferred, type of activity used and preferred, number of contact hours completed, and number of semester hours completed. That is, those with a good degree of motivation were more likely to participate in traditional activities (eg., classroom lectures) whereas those with less motivation were more likely to participate in activities such as independent study material. On-the-job application increased only with increased hospital size.

Rayburn's (1991) doctoral research focused on *barriers* and *facilitators* (it should be noted that theorists such as Valentine and Darkenwald (1990) now prefer the term *deterrent* to the very limiting *barrier*) to continued professional education among radiographers, nuclear medicine technologists, and ultrasonographers in Texas. She focused on activities that were self-selected and sponsored by an external agency.

She surveyed a group of 500 radiographers, 499 nuclear medicine technologists, and 536 sonographers (total $n = 1485$), receiving 510 responses (34.3 percent). One hundred and fifty-six (30.6 percent) respondents were male and 354 were female (69.4 percent).

The majority of her respondents were in the thirty-one to forty age group (286; 57 percent), with ninety-two respondents (18 percent) age twenty-one to thirty, ninety-eight (20 percent) age 41 to 50, and twenty-four respondents (5 percent) were older than fifty. Numbers do not always total 510 as Rayburn accepted partially completed questionnaires. Three hundred and sixty-one

respondents were married (71 percent), and 148 (29 percent) were single, separated, or divorced.

More respondents were employed in hospitals than other settings (293 to 216; 58 percent to 42 percent). Most were full-time employees (402; 79 percent); with twenty-six part-time (5 percent) respondents, seventy (14 percent) "other", and twelve (2 percent) unemployed.

Effects on participation were noted in terms of employment type (hospital based technologists were more likely to participate), modality (ultrasonographers engaged in more activities than other modalities), ethnicity (Mexican-Americans being more likely to engage in continued education), and education enrollment (eg., being enrolled in a B.S. program). No other effects were found to be significant.

No situational facilitators or barriers were found to be significant. These included "Interferes with Family", "Outside obligations", and "Child care demands." Differences did exist, but statistical significance ($p < .05$ or less) was not shown.

Dispositional barriers found to be significant were "Activities too time consuming" and "Uncomfortable." Dispositional facilitators were promotion of continuing education by former instructors and current co-workers, and intent to participate.

Institutional barriers found to be significant were "Employer red tape", "Work schedule interferes", and "Availability." Later regression analysis revealed these to be the most significant barriers to participation.

Teaching the Entry-level Adult Learner

Some research has suggested that the returning adult learner does not learn well from an andragogical, or "non-directed" approach (eg., Davenport and Davenport, 1986; Burnard, 1990; Russell, 1990). However, as the age of the student population increases (see for example Leslie, 1988; "Students Come of Age," 1988; and the 1989 Registry Statistics) it is clear that institutions that are accepting larger numbers of adult students have special problems to contend with. In my own program the average student age increased by six years - from 22 to 28 - in the five year period 1985-1990. The 1989 registry statistics showed an increase in the average age of radiography examinees from 23.2 in 1982 to 25.1 in 1989. These students enter with varying skills, abilities, and previous experiences to contend with.

Baker, Roueche, and Gillett-Karam (1990) have fused adult learning (especially motivation to learn) with concepts of leadership to develop a situational (contingent) teaching model based on Hersey's (1984) model. Educators are seen as leaders, and students as followers - thus the most important task is to motivate students to learn.

In congruence with Hersey's theory of situational leadership, it is the job of the educator to match teaching type with the developmental level of the learner. They argue that "analysis of these learning requirements should lead us to become more analytical about choosing particular leadership styles to fit certain situations, rather than assuming that a constant

style will be effective for learners as they move through our courses."

As teaching is leading, and leading is situational, there are a variety of "themes" important in motivation:

- Recognize and engage the student's desire to learn.
- Increase the opportunities for quality educational performance and success.
- Offer positive orientation, guidance, and direction through coaching.
- Use effective performance as an expectation by which to empower students.
- Work to limit or eliminate student obstacles.
- Motivate student to increased satisfaction for and development of learning skills.

Four archetypes are identified through their Teaching as Leading Inventory:

1. Influencers - Committed to clear objectives and are actively involved with students in completing them.
2. Supporters - Listen to students objectively and with an open mind. They are sensitive to students' feelings.
3. Theorists - Constantly analyze quantitative information about individual and group performance, and design learning experiences to increase performance.
4. Achievers - Try to create new ways of thinking and doing, and are constantly experimenting with new ideas

and methods.

Grow (1991) has independently developed a model based on Hersey's leader-follower grid, giving four stages of student-teacher stages:

1. Stage 1

Student-Dependent

Teacher-Authority/Coach

2. Stage 2

Student-Interested

Teacher-Motivator/Guide

3. Stage 3

Student-Involved

Teacher-Facilitator

4. Stage 4

Student-Self-directed

Teacher-Consultant/Delegator

He has developed a matching model, "Loops Around the Active Style." These are developed to allow the instructor to alter personal learning style to the needs/tykes of a group. This has been found to be uncommon, with Galbraith and Sanders (1987) finding, for example, that community college instructors tended to use styles of teaching that matched their own preferred learning style, regardless of student needs.

Implications for Practice

All education in radiologic technology is adult education. This poses special challenges for the educator, who must match societal needs with the learning needs and learning

style of the learner on an as individual basis as possible. What is probably needed is a code of ethics for the educator in radiologic technology. Based on the Principles of Good Practice in Continuing Education and information from this paper, the following is proposed:

1. All learners should be assumed to be adults capable of knowing and meeting their own learning needs until they show the instructor otherwise (capable until proven incapable). Their stage of development must be considered, as any group of adults will have varying capabilities.
2. All learning should be based on learning needs, with good patient care a concomitant goal.
3. All learning, entry-level and continuing, should be based on outcomes.
4. All learning experiences should be set to meet the needs of the learner.
5. The strength of all programs will be evaluated based on outcomes.

Questions for Future Research

The following questions for future research are proposed for radiologic technology adult education:

1. What is the relationship between continued education and the career ladder?
 2. Is there a value to mandated continuing education?
- No research or theory cited here found this to be

valuable; why has the profession gone ahead with implementation of a concept not proven to be worthwhile?

3. Is a generalist or specialist role desirable for the radiologic technology educator?
4. How can practice-based continuing education be promoted?
5. Is there a relationship between continuing education and professional status?
6. More research needs to be performed on deterrents and facilitators to participation in radiologic technology. What are the specific barriers and facilitators to various settings?
7. Edwards (1983) model needs to be validated. Has it changed over the years, perhaps with technology?
8. How can the reflective practitioner in radiologic technology be fostered?
9. What is the broad mission of adult education relative to radiologic technology? How deep should, for example, the "social enterprise" of adult education be fostered in radiologic technology?
10. How can content be best presented to all levels and types of learners?

Conclusion

This paper examined adult education as a concept and some applications of adult education to radiologic technology. The underlying theme was an attempt to integrate the philosophy, history, and practices of adult education with the discipline of radiologic technology as a guide to future theory and practice.

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